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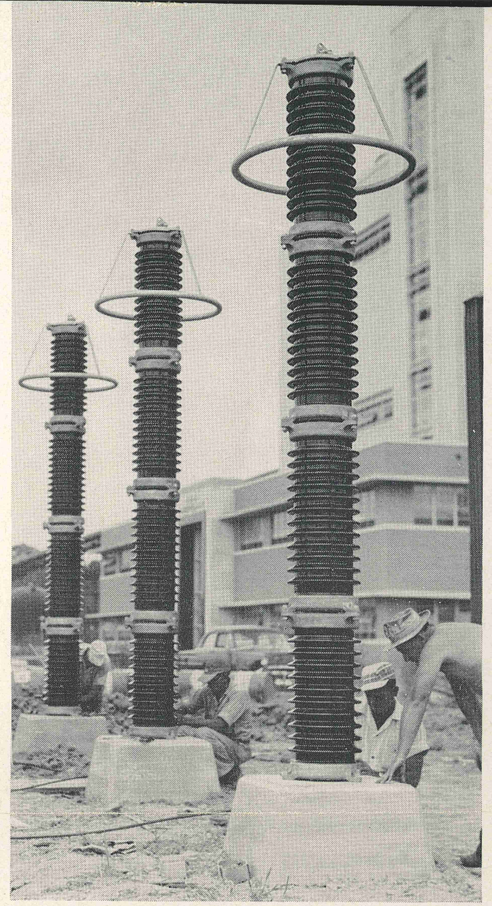

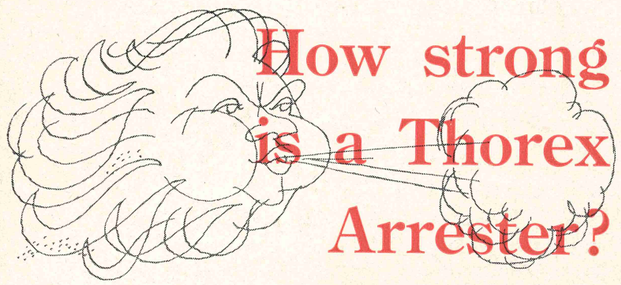

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Occasional applications call for resistance to violent natural forces . . . can the arrester take it?

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A more rare form of natural stress on a lightning arrester is earthquake shock. In connection with power station equipment, this is expressed in "G's" -- the "G" being the force exerted by applying an object's own weight at its center of gravity. Larger base-mounted Thorex arresters will develop at least 1G, and this increases as height and weight decrease. Such strength is considerably in excess of earthquake construction requirements.

It is not our point to imply that Thorex arresters will be the only thing left intact in the event of disaster. Unestimated forces, flying debris, or the collapse of connected structures may destroy them. But, in themselves, they represent no weak link when a station is exposed to violent natural disturbances.

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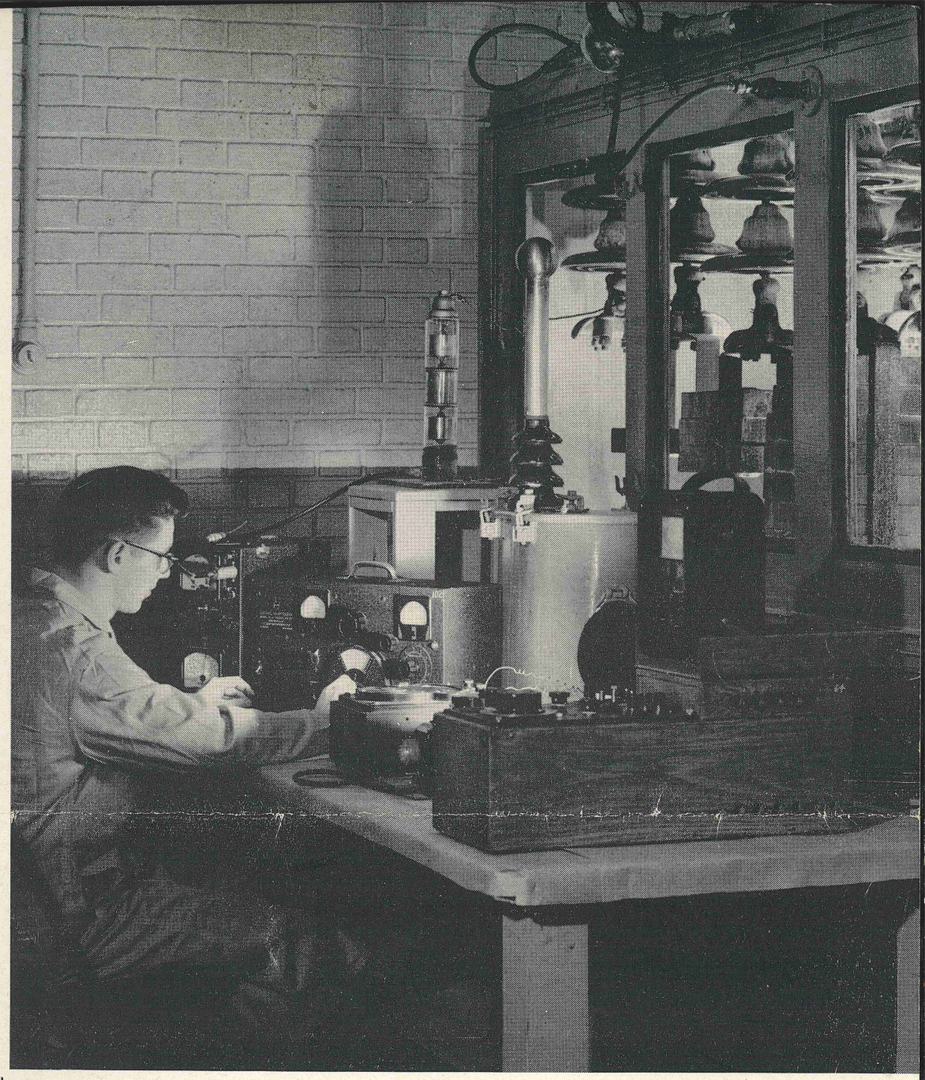

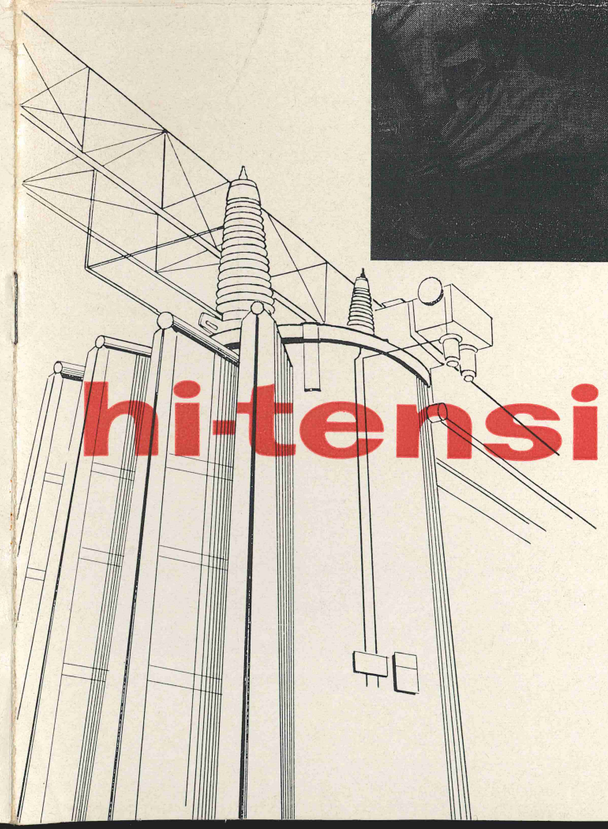

hi-tension news

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AUGUST 1956

TECHNICAL COMPETENCE

MAGNAFLUX

. . . Sees trouble before continuous quality testing process it happens

"Black Light" and magnetism are used to protect O-B Hi-Lite Strain Clamps and Suspension Clamps from hidden defects that would ordinarily not be revealed. Magnaflux-Magnaglo, as this important inspection process is called, can reveal sources of trouble in critical parts so that our manufacturing processes can be improved and our products dependability in service unquestioned.

Fluorescent particle inspection was developed in 1929 by A. V. DeForest and adopted and licensed by Magnaflux for use by industry. The Magnaflux method of inspection is the most suitable for the requirements of thorough inspection for Hi-Lite Strain Clamps and Suspension Clamps. Neither the machine nor the process is complicated and odd-shaped pieces can be checked without special fixtures or methods. Because of its simplicity and speed, without sacrifice of accuracy, 100 per cent inspection can be made of materials such as O-B Hi-Lite Strain Clamps and Suspension Clamps that demand a high degree of quality control. The dependability and quality of these clamps can be accurately measured and manufacturing processes controlled or improved if necessary.

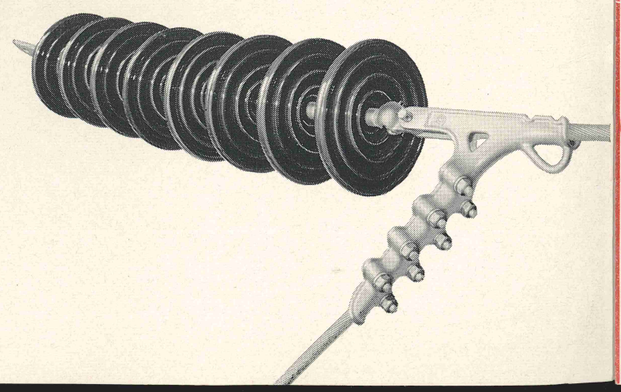
The piece to be tested is submerged in a bath of fluorescent magnetic particles suspended in an oil solution, then magnetized by a large coil. Thereafter, when viewed under ultra-violet light, the magnetic particles fluoresce and are clearly visible where they cling to the surface of the part. Any irregularity in the make-up of the casting, that by ordinary visual inspection would be undetected, will cause the magnetic particles to be characteristically aligned along the fault. Under "Black Light" the imperfection in the metal becomes clearly visible.

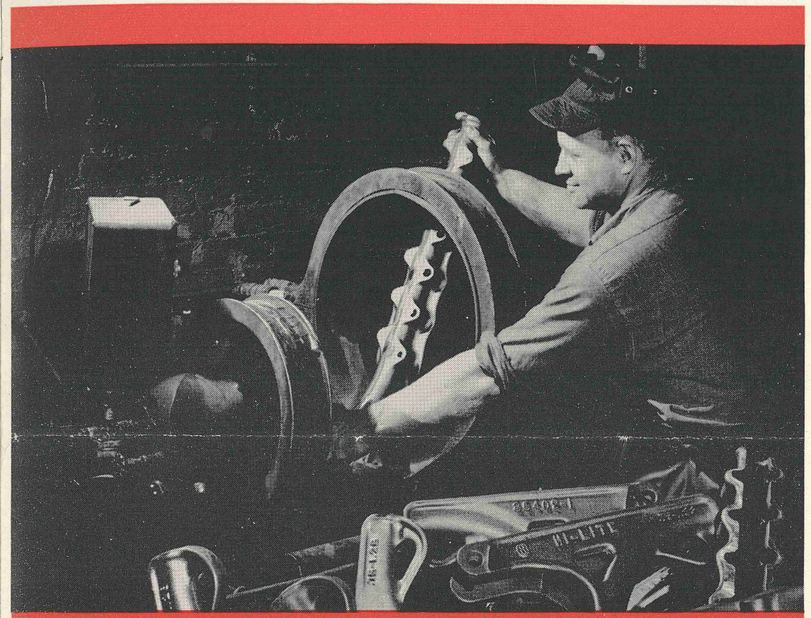
In conjunction with the Magnaflux inspection operation, there are three additional visual inspections on 100 per cent of production and a sampling inspection whereby the parts are gauged and put under strain until breakage occurs. The sampling inspection is statistically controlled to assure the highest quality control standards.

The Magnaflux inspection is given the additional responsibility of long range improvement in casting procedure by O-B's quality control system. Rejected castings are analyzed, the cause for their defects are determined and corrections are made. We're not content until each one is perfect.

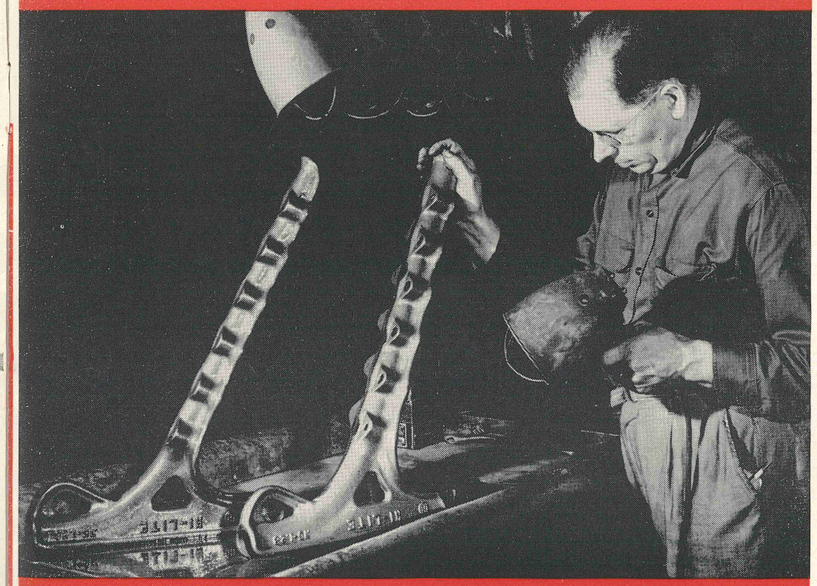
Ohio Brass clamps are well known for having given unfailing service for decades. Magnaflux inspection is an important element in our continuing effort to assure highest performance of our products. The use of Magnaflux-Magnaglo as an integral part of O-B's Hi-Lite Strain Clamp and Suspension Clamp quality control system is another application of Technical Competence, the heart of every O-B product.

Careful inspection and quality control assure complete freedom from defects in the high strength O-B clamps and insulators.





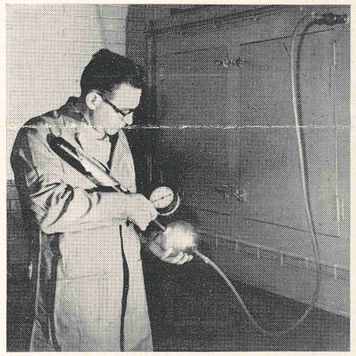
After being coated with an oil solution containing magnetic particles, the clamp undergoing inspection is placed in an electro-magnetic coil where it is magnetized.



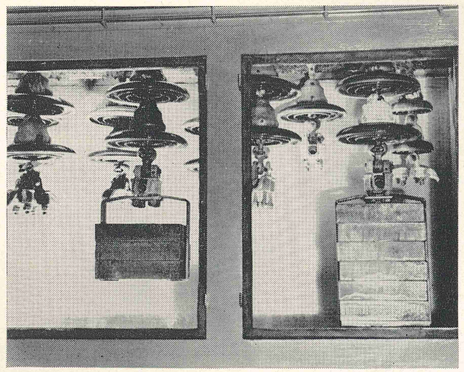
Under ultra-violet light, the magnetic particles fluoresce and any irregularity in the polarity of the casting is clearly visible as a bright yellow glow on the surface of the part under inspection.

What have we learned about TV Interference?

Progress report on O-B research shows properly installed insulators are not the cause . . .



Study of effects of corrosion on insulator and hardware performance is carried out in special chamber at Barberton. Technician is releasing measured amount of sulphur dioxide into chamber.



A discussion of television interference follows much the same pattern as earlier discussions on radio interference.

You may recall that during the early days of radio there were numerous customer complaints about interference. Investigation showed that 19 out of 20 cases were from causes other than power company equipment. Among the devices with an enviable reputation for being noise-free were suspension insulators.

The growth of television has again introduced the question of interference. There have been a few reports of complaints from customers, sounding much like the ones from the early days of radio. Fortunately, they have been less numerous.

The frequency range of television has been a mitigating factor. Whereas with radio interference an offending element might blanket a large area, TV interference is usually restricted to small areas. It does not propagate for long distances over conductors and may be localized at a single structure.

Judging from the number of customer complaints reported to us by power companies, TV interference originating from a transmission line is indeed a rare phenomenon, could almost be described as a "freak."

Nevertheless, when a customer complaint is investigated and a transmission or distribution item is correctly analyzed as the source, correction is usually required.

Realizing our responsibility as a combined insulator and hardware manufacturer, we've taken the problem seriously.

Several years ago it became apparent that a full investigation of the phenomenon was necessary in order to find **permanent** methods of overcoming TV interference.

Emphasis is placed on the word "permanent" because we realize there are numerous corrective methods that are apparently successful. But only time and a comprehensive research program will prove permanence of correction.

Our concern led to a full-scale study of TV interference at the O-B High Voltage laboratory in Barberton.

We fully realized we were attacking a varied and complex problem because of . . . .

. . . difficulty in obtaining offending specimens.

. . . difficulty in determining whether specimens we did receive were actually producing interference.

. . . problems in getting laboratory samples to behave like specimens from the field.

We proceeded by analyzing field specimens to determine how they contributed to TV interference. After determining that certain types of corrosion were responsible, we had to find corrosive agents that would produce the same results much faster, under controlled conditions and without having to depend on the slow and random formation of corrosion by natural processes.

A combination of high humidity and sulphur dioxide produced the desired results. Then came the problem of developing measuring techniques to study growth of corrosive layers and of determining how they caused TV interference. All this research was carried out in a specially built corrosion chamber.

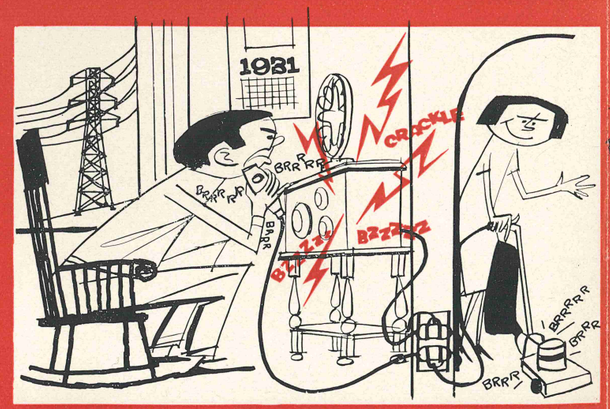
OUR PROGRESS REPORT

This is a progress report on what has been learned up to now. Naturally, the study will continue. But we do have indications of corrective methods that could be used, methods that promise a permanent solution to this type of TV interference problems.

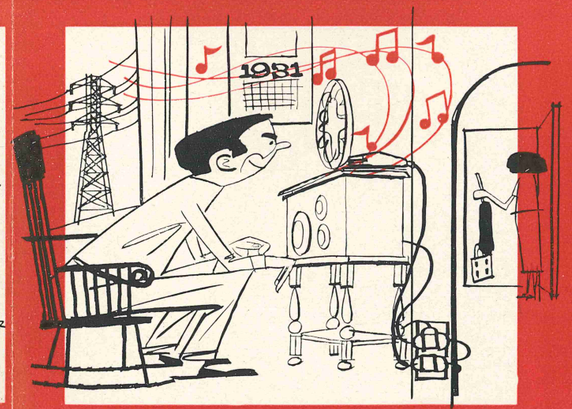
HOW DOES TV INTERFERENCE DEVELOP?

Our study of insulators and hardware returned from field service and of similar specimens in the corrosion chamber shows that insulating oxide layers develop on mating, load-bearing metal surfaces. Under normal loading, the insulating layers are diminished by the combination of weight and movement. But when strings are not sufficiently loaded and no movement is present,

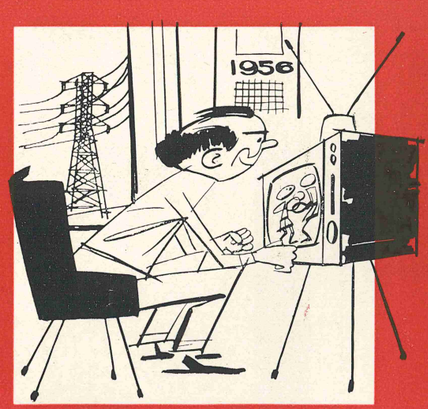
Admitting that we've oversimplified the problem, this series of cartoons summarizes our story on radio and television interference . . . . In the past 30 years it's been established that properly installed suspension insulators do not cause radio interference.



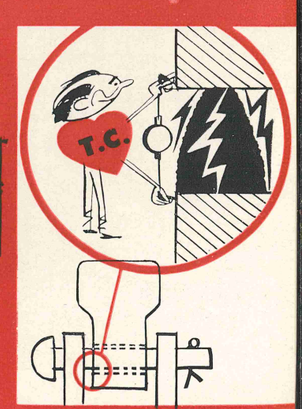
When complaints are investigated, the cause of interference is usually a defect in the radio itself, another appliance or some other local condition.



Complaints about television interference are even more rare. Our investigation has showed that properly installed suspension insulators do not cause interference.



On strings that are not fully loaded, however, insulating oxide layers may develop on mating, load-bearing metal surfaces.



insulating oxide layers may form and remain intact at strategic locations.

An insulating layer tends to interrupt the normal flow of charging current. As a result, voltage builds up across the layer until a miniature spark occurs through or adjacent to the layer. This voltage build-up occurs during each half cycle of power frequency applied to insulator and hardware combination. The resulting sparking (only one milliampere or less) through insulating layers can be a possible source of television and radio interference.

HOW WIDESPREAD IS TV INTERFERENCE?

Fortunately, the conditions leading to TV interference rarely develop. When they do develop, increased loading of strings will decrease the possibility of interference recurring.

The sound basic design of high voltage lines in itself tends to prevent TV interference from this source. Since load on each tower and insulation point is carefully figured, underloading is not likely.

If there is TV interference, the places to look for trouble are slack spans, short spans, points of uplift, or jumper supporting insulators whether they be on transmission or distribution lines.

HOW TO PREVENT TV INTERFERENCE

A simple way to solve the problem is to add extra weight to insulating supports that are underloaded. The weight, plus movement of the string, will diminish the layers of insulating oxide at load-bearing points.

We believe our Barberton research eventually will provide definite information on the amount of weight needed for a specific string.

What about the installations where additional load can not be applied? We're also trying to find ways of preventing TV interference there. We've experimented with conducting greases and metallic coatings that bring temporary help, but we're not yet sure of the permanence of the correction.

A FEW WORDS OF CAUTION

Many approaches have been investigated. Many of them work immediately. Some show promise of prolonged benefits. Others last only a short time. Sometimes the corrective device itself eventually causes additional TV interference. So except for proper loading of insulator strings, the permanence of any other correction method has not yet been proved.

OUR PRINCIPAL CONCLUSIONS

Properly loaded suspension insulator strings do not cause TV interference.

Cases of TV interference originating from insulator strings are extremely rare. When they occur, inadequate loading is usually the cause.

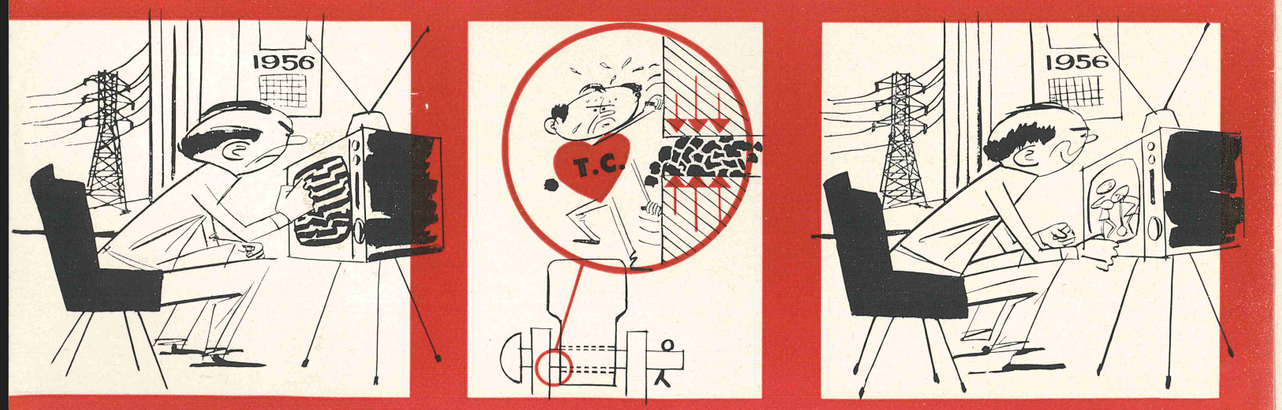
The combination of weight and movement on the string diminishes the insulating effect of oxide layers that form on load-bearing surfaces.

The permanence of most proposed corrective measures has yet to be proved so they should be used cautiously.

The resulting electrical breakdown through or adjacent to the insulating layers may be a source of local interference.

On rare occasions when this condition develops, one solution is to increase the load across the insulating oxide film.

The combination of weight and movement diminishes effect of insulating layers. Reception returns to normal.



MONOGRAPH #10

When insulators sizzle and pop on this "frying pan" we know they're well done . . .

In two large rooms just a few feet from the kilns in the O-B Barberton plant, "pan" tests are being conducted almost continually during any working day.

As you approach the area, you hear a continuous sizzling sound punctuated by staccato explosions like firecrackers detonating. Here's what's going on.

In the pan test, a large number of similar porcelain pieces or completed insulators are arranged upside down in rows in a shallow metal pan. The pan serves as an electrode.

The other electrode is a chain draped centrally into the upper part of each shell and connected to a high-voltage overhead bus.

In the test, 60-cycle voltage is applied between the overhead bus and the metal pan. It is increased in magnitude until insulators are flashing over vigorously, making the "firecracker" sound. The "sizzle" is the corona that precedes flashover.

Flashover occurs on each half cycle of the 60-cycle wave and hops indiscriminately from insulator to insulator. If there is a test specimen failure, the flashovers stop. The defective piece is removed and the test is continued for at least two minutes.

Pan testing is carried out according to the provisions of ASA C 29.1, 1944, pgh 7.1.2 which specifies that specimens shall be subjected to "vigorous dry flashover for a period of from three to five minutes."

A five-minute pan test presents each insulator with 36,000 opportunities for flashover (120 half cycles per second X 300 seconds) at a power frequency. A critic of this type of testing might point out, quite correctly, that, 60-cycle power system voltage seldom has enough magnitude to cause dry flashover in the field. Yet the factory loss record obtained from this test -- even though it's a loss of less than one-tenth of one per cent -- is an important historical quality control guide. With it, we can relate the expected field performance of the batch under test to performance actually experienced with similar insulators tested during the past several decades.

All porcelain insulators -- uniparts, multiparts, switch types, suspensions, posts -- are given the pan test before assembly.

The test on the unassembled parts is much more severe since electrical stress during flashover is greater on the piece than when it is part of an assembly. But we're quite willing to let the parts sizzle and pop, too. If the individual parts can take it, we're that much more certain that the assembled unit will perform as it should.

The pan test can be correctly considered as a test of dielectric reliability. It's much like the BTU curve kept in a power plant. When the curve begins to creep above the level at which the plant is rated, it's time to look for trouble. We use our pan test results much the same way, as a quality control check on materials and manufacturing methods.

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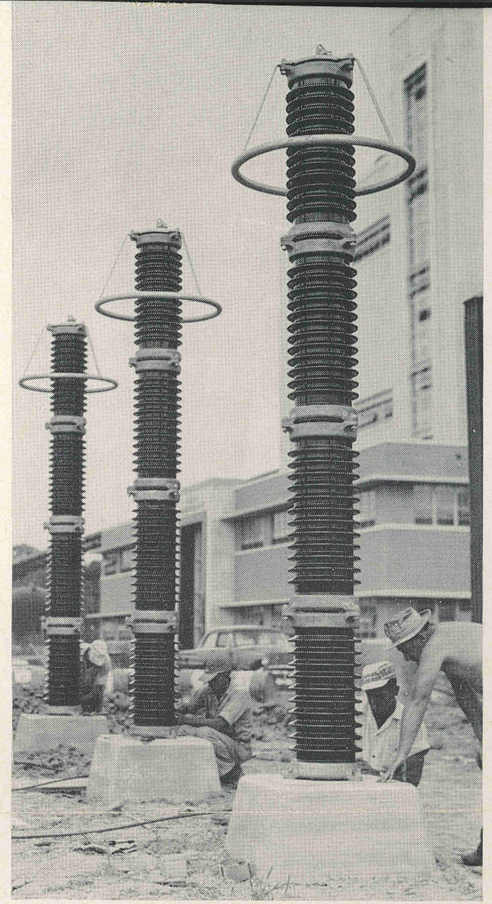

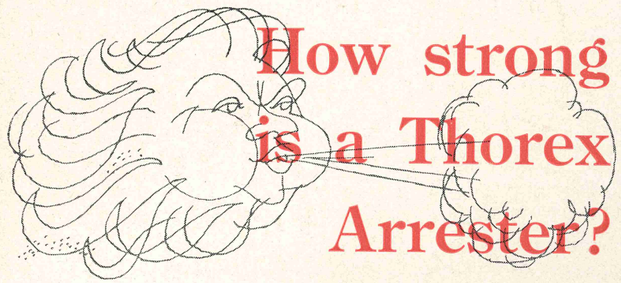

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